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An economic study of demand led rice breeding for varietal improvement in Raipur district of Chhattisgarh

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Abstract
The share of Agriculture in GDP of state was 16.2%, in 2019-20. The state has contributed the major share in production of cereals. Among cereals, rice is main crop and cultivated in 4.7 m. ha area of the state. "An economic study of demand led rice breeding for varietal improvement in raipur district of Chhattisgarh." of the state was conducted during 2019-20. The study covered 10 villages of Raipur districts, Arang block and Dharsiwa block primary data on all the relevant aspects were collected from 100 farmers. This study was specifically carried out for Swarna variety of rice, which used for preparation of flakes rice. Formal survey method was used to augment data from sample of Swarna rice variety growers. The findings of the study revealed that the average farm size of sample farms was registered to be 2.47 ha. Overall, cost of cultivation of Swarna rice variety was accounted Rs./ha 37090.31, which comprised of 61.14 per cent of labour cost followed by input material cost (32.56%) and fixed cost (6.30%), respectively. Overall, yield of Swarna rice variety was recorded to be 55.79 q/ha. The gross return of Rs./ha 87432.40 was obtained from Swarna rice variety. Input output ratio was found to be 1:1.78 the major constraint in cultivation of rice was as pest and disease followed by weed problem and labour non-availability.

Keywords: costs and return of rice, profit of rice, Raipur rice, Raipur rice production and production constraints of rice

Introduction
India occupied 41.85 m. ha area under rice crop and production of 133.70 m. tones. It is the major staple food of the country. Chhattisgarh State is well known as a rice bowel of India and rice is grown is more than 80% of the total cropped area. The majority of rice area brought under rainfed rice ecosystem. Among the 28 districts of Chhattisgarh State, Raipur district having nearly 161.18 cropping intensity and Rice- Rice- Fallow cropping pattern is prominent in the district. The district is 11th in position of area and 4th place in production of the state (Anonymous, 2013-14) [2].

Swarna variety next to MTU 1001_variety of rice is grown in area of Raipur district. Swarna variety having some desirable traits to attract the farmers for its cultivation. This variety having great industrial importance for preparation for Murra and having good market value. The adoptability of Swarna both rainfed and irrigated ecological situation of the state. Therefore, a present study was undertaken to analyze the economics of rice cultivation and constraints during the production faced by farmers of Raipur district.

Materials and Methods
The study was confined to Raipur district of Chhattisgarh State because rice was grown in both *Kharif* & *Rabi* seasons and more number of rice mills under operation that have greater requirement of Swarna variety of rice to mills. Out of four block of the district, Arang block and Dharsiwa block was selected randomly; 10 farmers of Swarna rice variety growers were selected randomly from each village of the both block, totally 100 Swarna rice variety grower farmers were for the study. The primary data were collected on well structured schedule design from sample farmers on all the relevant aspects to fulfill the objectives of study. The primary data were pertaining for *Kharif* season of agriculture year 2019. The simple averages and percentage statistical tools were applied to analyze the data and report the results/ outcomes of the study.

Input output ratio = Gross income / Total cost.
Benefit-cost = Net income / Total cost.

Results and Discussion

Average farm size and area under as Swarna rice variety

It is essential to understand the area under paddy as well as percentage area under Swarna rice variety of sample farms of the study area and same is presented in table 1. It reveals that average farm size of sample farms was registered to be 2.39 ha. The average farm size was noticed to be 0.96 ha at marginal farms, 1.57ha at small farm, 2.95 ha at medium farms and 5.15 ha area large farms, respectively. The area under paddy crop was accounted more than 94 per cent, irrespective to the farm size of holdings. While, it was found the maximum at marginal farms and to be 98.91 per cent area under paddy, which was followed by large farms (98.90%), small farms (96.47%) and medium farms (91.34%), respectively.

Swarna rice variety area found to be 60.68 per cent to the total paddy area, irrespective to the farms size of holdings. The area of Swarna was noticed the maximum at marginal farms and found to be 72.53 per cent area followed by small farms (65.85%), medium farms (60.13%) and large farms (50.97%), respectively. It confirms that the state has recognized as rice bowel of India and Swarna rice variety are being growing by formers in the major area looking to their market value and industrial importance.

Input materials cost for cultivation of rice

The input materials cost for cultivation of Swarna variety of rice was worked out in Rs./ha, which is presented in table 2. It reveals that overall, input materials cost was accounted Rs./ha 17222.18 The cost of fertilizers was noticed to be the highest Rs./ha 7745.55 and shared 44.97 per cent to the total input materials plant protection chemicals (37.88%), seed (15.71%) and interest on working capital (4%), respectively. The total input materials cost was ranging from Rs/ha 16685.59 at marginal farms to Rs/ha 18393.66 at large farms. It can be inferred from results that total input materials cost was increasing with increases the farm size of holdings. Overall, yield of rice was found to be 43.57q/ha and 32.68q/ha and by – product of Swarna variety of rice. It was recorded the maximum at marginal farm and found to be 46.44 q/ha and 34.83 q/ha of main and by – product, respectively.

Table 1: Average farm size and cultivated area of sample farms

				(in ha)
Farm size	**No. of sample farm**	**Average farm size**	**Area under paddy***	**Area under Swarna****
Marginal	35	0.96	0.91	0.66
			(94.79)	(72.53)
Small	22	1.57	1.45	1.08
			(92.36)	(74.48)
Medium	23	2.95	2.75	1.84
			(93.22)	(66.91)
Large	20	5.15	4.99	4.21
			(96.89)	(84.37)
Average	25	2.65	2.52	1.94

Note: *Figures in parenthesis indicates the percentages area of paddy to average farm size
**Figures in parenthesis indicates the percentages area of Swarna rice variety to the area under paddy

Labour use cost for cultivation of paddy

It is essential to account the total cost on labour use per hectare for cultivation of paddy especially Swarna variety of rice. Therefore, labour use cost was worked out in Rs/ha Overall, the hired labour cost was registered to be Rs./ha 4129.85 and imputed value of family labour cost was noticed to be Rs./ha 6013.33. The share of hired and family labour cost to the total labour cost was found to be 40.71 and 59.28 per cent, respectively. The hired labour cost for cultivation of paddy was ranging from Rs./ha 2169.94 to Rs./ha 8847.33, irrespective to farm size of holding. The use of hired labour cost was increasing with increases in the farm size of holdings while it was just opposite in use of family labour cost it was found to be decreasing with increases in the farm size of holdings. The share of family and hired labour cost to the total cost of harvesting was 59.28 and 40.71 per cent, respectively. It indicates that family owned labour was participated more in the major operation of paddy cultivation than that of hired labour. Out of the total cost of cultivation of paddy, bullock/ machine use cost was shared 2.50 per cent and accounted Rs./ha 1191.84.

Fixed cost for the cultivation of paddy

The fixed cost comprised of land revenue & taxes, depreciation on land & building and interest on fixed capital, which was worked out in Rs./ha and given in table. It reveals that fixed cost was increasing as increases in the farm size, which was found to be Rs./ha 13229.88, Rs./ha 13234.03, Rs./ha 13235.48 and Rs./ha 13238.36 at marginal, small, medium and large farms, respectively. The higher fixed cost was noticed at medium and large farms because of their owned tractors. The overall fixed cost on paddy cultivation accounted to be Rs./ha 13233.12. Overall, depreciation on land and building was found to be highest, which shared to 90.68 per cent to the total fixed cost followed by interest on fixed capital (7.40%), and land revenue and taxes (0.9%). The revenue and taxes to the total cost were found to be the same at all categories of farms. While depreciation were notice to be increasing with increases in farm size. The fixed cost for the cultivation of paddy was ranging from Rs./ha 13229.88 to Rs./ha 13238.36 with irrespective to farm size of holdings.

Costs and return of cultivation of rice

The cost for cultivation of Swarna variety of rice is given in table 5. Overall, cost of cultivation of paddy was accounted Rs./ha 47732.72, which shared of input materials cost by 27.73%, labour cost 72.27% and fixed cost by 6.30%, respectively Neeleppa, 2002 and Tarar 2007 has also been noticed the similar findings. The cost of cultivation of rice was ranging from Rs./ha 46877.05 to Rs./ha 49400.56 irrespective to farm size of holdings.

On an average obtained gross income of sample farm in paddy cultivation was Rs./ha 84661.69, which was ranges from Rs./ha 90232.92 at marginal farms to Rs./ ha 76534.77

at large farms. The net income was received Rs./ha 36928.97 by sample farms which was ranges from Rs./ha 43355.87 at marginal farms to Rs./ha 27134.21 at large farms (Mohandas and Thomas, 1997; Suneetha *et al.*, 2013) [4, 7]. It indicates that cultivation of paddy is profitable. The result of return on per rupee investment confirms that it has gone down when increases the farm size. The return on per rupee investment was the maximum at small farms and found to be 1:1.92 followed by marginal farms (1:1.78), medium farms (1:1.60) and minimum at large farms (1:1.55). Output – input ratio on average farm size was registered to be 1:1.78. Overall, cost of production per quintal of rice cultivation was registered to be Rs./q 1101.11, which was ranging from Rs./q 1009.41 to Rs./q 1254.14 across the farm size.

Table 2: Costs of Cultivation of Swarna at sampled households (Rs./ha.)

S. N.	Particular	Marginal	Small	Medium	Large	Overall Average
A.	Variable Cost					
1	Material cost					
	Seed	2575.28	2604.48	2954.17	3018.76	2706.93
		(5.49)	(5.50)	(6.01)	(6.11)	(5.67)
	Manures and fertilizer	6931.23	7907.45	8371.99	9179.46	7745.55
		(14.79)	(16.71)	(17.04)	(18.58)	(16.23)
	Plant protection	6949.69	6669.11	5789.47	5918.41	6525.34
		(14.83)	(14.09)	(11.78)	(11.98)	(13.67)
	Irrigation charges	229.39	231.42	275.88	277.03	244.37
		(0.49)	(0.49)	(0.56)	(0.56)	(0.51)
	Total material cost	16685.59	17412.46	17391.51	18393.66	17222.18
		(35.59)	(36.79)	(35.39)	(37.23)	(36.08)
2	Human labour cost					
	Family labour	7819.74	6011.16	4754.91	1604.84	6013.33
		(16.68)	(12.70)	(9.68)	(3.25)	(12.60)
	Hired labour	2169.94	3156.19	6961.72	8847.33	4129.85
		(4.63)	(6.67)	(14.17)	(17.91)	(8.65)
	Total human labour cost	9989.68	9167.35	11716.63	10452.17	10143.19
		(21.31)	(19.37)	(23.84)	(21.16)	(21.25)
3	Power use cost					
	Bullock labour	1559.84	1014.81	895.71	853.88	1191.84
		(3.33)	(2.14)	(1.82)	(1.73)	(2.50)
	Machine power	4117.94	5189.72	4525.09	5071.64	4615.49
		(8.78)	(10.97)	(9.21)	(10.27)	(9.67)
	Total power use cost	5677.78	6204.53	5420.80	5925.52	5807.32
		(12.11)	(13.11)	(11.03)	(11.99)	(12.17)
	Interest on working capital @4%	1294.12	1311.37	1381.16	1390.85	1326.91
		(2.76)	(2.77)	(2.81)	(2.82)	(2.78)
	Total variable cost	33647.17	34095.71	35910.10	36162.20	34499.60
		(71.78)	(72.04)	(73.07)	(73.20)	(72.28)
B.	Fixed Cost					
1	Depreciation	237.89	241.73	243.07	245.74	240.89
		(0.51)	(0.51)	(0.49)	(0.50)	(0.50)
2	Land revenue	12.00	12.00	12.00	12.00	12.00
		(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
3	Rental value of owned land	12000.00	12000.00	12000.00	12000.00	12000.00
		(25.60)	(25.35)	(24.42)	(24.29)	(25.14)
4	Interest on fixed capital @8%	979.99	980.30	980.41	980.62	980.23
		(2.09)	(2.07)	(1.99)	(1.99)	(2.05)
	Total fixed Cost	13229.88	13234.03	13235.48	13238.36	13233.12
		(28.22)	(27.96)	(26.93)	(26.80)	(27.72)
	Total Cost (A+B)	46877.05	47329.74	49145.57	49400.56	47732.72
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figure in parenthesis were percentage to the total cost of cultivation

Table 3: Per hectare yield, value of output and cost of production per quintal

S.N.	Particular	Size of Farms Group				Overall Average
		Marginal	Small	Medium	Large	
1	Main Product (qtl./ha)	46.44	43.34	40.41	39.39	43.57
	Price (Rs./qtl.)	1868.00	1868.00	1868.00	1868.00	1868.00
2	By product (qtl./ha)	34.83	32.51	30.31	29.54	32.68
	Price (Rs./qtl.)	100.00	100.00	100.00	100.00	100.00
3	Gross returns (Rs./ha)	90232.92	84209.62	78516.63	76534.77	84661.69
4	Cost of cultivation (Rs./ha)	46877.05	47329.74	49145.57	49400.56	47732.72
5	Net returns (Rs./ha)	43355.87	36879.88	29371.06	27134.21	36928.97
6	Cost of production (Rs./qtl)	1009.41	1092.06	1216.17	1254.14	1101.11
8	Input output ratio	1.92	1.78	1.60	1.55	1.78

Constraints in production of rice

The opinion of farmers with respect to constraints in production of rice have taken on types of rainfall distribution, occurrence of disease & pest, weed infestation & deficiency of soil fertility, drought faced. However, under input constraints on availability of seeds, labour, manure & fertilizer, irrigation were asked to the farmers. The opinion of farmers with regards to constraints on availability of bullock & tractor power and technological constraints have taken. The elicitation of farmers with regards to production constraints, infestation of insect was the main problem in cultivation of rice as reported by 78 per cent farmers (Nirmala and Muthuraman, 2009) [6]. Infestation of disease to the crops was the next problems, which was reported by 63.5 per cent farmers. Weeds were third problem in the cultivation of rice, which was reported by 56 per cent farmers. Soil toxicity, rainfall and submergence were also reported by farmers of study area, which were reported by 53, 41.25 and 27 per cent farmers, respectively.

In case of availability of inputs, labour availability was the main constraints in cultivation of rice, which was reported by 48 per cent farmers followed by fertilizer (47%), non-availability of seed (46%). Farm yard manure and irrigation was not timely available as reported by 45 per cent and 30 per cent farmers, respectively. The non- availability of technology was the major problem *i.e* reported by 54 per cent farmers followed by tractors 38.09 per cent and bullock pair was other constraints reported by 24 per cent by farmers.

Conclusion

Swarna variety of rice is profitable than that of other rice varieties due to having industrial importance for preparation of flakes rice in the study area. The obtained net return was Rs./ha 36928.97 and input-output ratio was noticed to be 1:1.78. The possibilities to increase the productivity of Swarna variety to supplement with modern technologies to the farmers. The productivity of crop restricted by infestation of pest and disease to the crops, which was reported by 78 and 63.50 per cent farmers, respectively. Weed infestation was third major problem in the cultivation of rice which was reported by 56 per cent farmers.

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